Elections Division
Office of the Secretary of State

Report of the Secretary of State on the Examination of a Modification of Premier Election Solutions Voting System

May 2009

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Overview

Application

The King County Director of Elections, Sherril Huff applied for an Emergency/Provisional certification of Premier Election Solutions Assure 1.2 Voting System in accordance with WAC 434-335-210 in order to upgrade their central count tabulation to minimize the overall risk of administering elections in King County with their current equipment. Failure to modify the existing system materially affects the efficiency, accuracy and security of the upcoming elections.

Current Voting System

The current vote tabulation equipment in King County has reached the end of its life expectancy. King County implemented the current equipment in 1998 and it has since been used in 63 separate elections, numerous recounts and tabulated millions of ballots. Parts are no longer available for portions of the optical scanners or ballot feeders used in the central count environment. The county is also unable to purchase additional new or used ballot feeders to supplement the current system. The tabulators used for central count are poll site tabulators, and were not designed for the high speed tabulation needed for central count, especially the number of ballots King County processes at central count.

In addition, the population growth in King County combined with increasing complexities of administering elections has taxed inherent database limitations in the current system. Contingency plans had to be activated in the 2008 General Election to split the vote tabulation database to allow for processing the large number of ballot styles. Given the complexity of an odd year election, even more ballot styles are expected for the 2009 elections.

Modified Voting System

The modified voting system, labeled Assure 1.2, employs two new modules for central count and security management, along with modifications to the existing GEMS software. The central count tabulation module employs high speed scanners and new database technology to process the high volume of ballots and ballot styles present in King County elections.

National Certification

The Assure 1.2 system was developed by Premier over two years ago, and presented to the Election Assistance Commission (EAC) in 2007 for national testing and certification. The following parts of the system have been approved by the EAC:

- Source code review
- Data accuracy test for new scanners
- Hardware environmental tests on new scanners.
- Hardware testing

Why an Emergency State Certification

Although parts of the Assure 1.2 Voting System have received EAC approval, the final test report by the national Voting System Test Laboratory will not be finished in time for King County Elections to begin setting up for the 2009 fall elections. The anticipated completion is the first week in June. The county requested an emergency state certification to bridge the gap until the national certification is complete.

Testing Plan

Testing and evaluation of Premier Assure 1.2 voting system was conducted by Secretary of State staff, in conjunction with King County Elections' staff, between January 20 and May 1 in the King County Elections Center in Renton, Washington. Examining the system for the Office of the Secretary of State was Patty Murphy, Voting Systems Specialist and Paul Miller, Senior Technical and Policy Analyst. In addition, King County Elections hired third party experts in information technology security and election practices to provide additional expertise in system evaluation.

A four phase testing program was developed by King County Elections, and approved by Secretary of State staff for state certification testing.

Delivery acceptance testing of the equipment and software to determine if the correct model and versions of the equipment and software are delivered and that the equipment, software and system operate as documented by the vendor.

A Mock election to ensure that the equipment, software and system perform each of the functions required by federal, state and local law in order to administer an election from the beginning to the end.

Volume/stress testing to ensure that the equipment, software and system will stand up to the maximum expected volume for King County's largest election as

well as the system's ability to handle the unexpected, such as an unanticipated spike in adjudication activity. This will be done by exercising the system with 50 percent more volume than expected and evaluating system performance. It will highlight if the equipment is properly sized in CPU capacity, system memory, etc. to meet Elections needs without crashing, unacceptable performance degradation or compromising the integrity of the system. It will also provide a measurement of the system's ability to handle the projected growth in voter registration over the life of the system (six – eight years). Additionally, this type of test will help identify whether there would be any database size issues such as those experienced with the current system.

Security review to ensure examination by third party information technology security experts beyond the federal certification process and provide confidence that any security risks are identified and mitigated.

Executive Summary of Findings of Secretary Of State Staff

Environment Stability

King County elections set up a testing environment with all the scanners and adjudication stations that would be utilized during their largest elections. They assigned user and work station permissions and network communication configurations based on practices designed for maximum security and accountability.

Mock election testing uncovered problems with network communication between the devices.

The testing was halted while Premier staff rebuilt the software environment, step by step to test each setting until the environment proved stable. The mock election was restarted from the beginning.

English, Chinese and Accessible Voting Unit (AVU) ballots were tested in the Mock Election and results confirmed, with a 100% accuracy rate. Each of the functions required by federal, state and local law performed as required. Two new features for AVU voting were also tested – sip n puff and paddles.

In addition, a machine recount was tested to ensure it met applicable state law.

Adjudication Station Delays

During the Volume/Stress test, 1,500,000 folded ballots were processed to test the outer limits of the system capabilities. As the number of ballots grew on the adjudication stations, there was a noticeable slowdown in processing the adjudication decisions. The cause of the slow-down was discovered, and a windows setting was changed to prevent future slowdowns.

The county was able to process (scan and adjudicate) 215,000 ballots in one 10-hour period.

At the conclusion of the volume/stress test, there were two ballot errors out of 1,500,000 scanned ballots. The two ballots were miss-feeds that were not picked up by the scanner, but were picked up during the adjudication process. The system is designed to identify and report at the time of adjudication any ballot discrepancies caused by miss-feeds during the scanning process that were not picked up by the scanner so that workers will be alerted and process the ballot(s) affected properly.

Humboldt County Missing Ballots

A software error with Premier GEMS central count software was discovered in Humboldt County, CA with the processing of absentee ballots during the 2008 General Election. This error is not present in King County's current GEMS software, or the modified software with this certification.

Audit Log Deficiencies

While investigating the software error problem in Humboldt County, it was discovered that the GEMS tabulation audit logs are deficient. This deficiency is a separate issue from the software error discovered by Humboldt County.

King County's current GEMS system does contain some of these audit log deficiencies. The upgraded version of the GEMS software, with the Assure 1.2 software, addressed all the deficiencies with the audit logs. The new modules (PCS and Assure Security Manager) that are part of this certification do not have audit log deficiencies.

Conclusion

After an evaluation of the system as upgraded, staff believes the system and its components continue to meet current Washington State requirements.

Technical Report Findings of Secretary of State Staff

Environment Stability

During the mock election test machine errors and system slowdowns occurred, indicating a potential unstable environment. The testing was halted while Premier staff rebuilt the software environment. Each configuration setting in the operation system was tested with the Assure network, as well as security and user permissions and communications between devices to produce a stable environment. This installation configuration was documented. The mock election was restarted, from the beginning, and the environment proved to be stable.

English, Chinese and Accessible Voting Unit (AVU) ballots were tested in the Mock Election and results confirmed, with a 100% accuracy rate. Each of the functions required by federal, state and local law performed as required. [The mock election consisted of 9,025 English ballots and 9,025 Chinese ballots, with additional ballots added to achieve as many unique results as practical.]

Two new features for AVU voting were also tested – sip n puff and switch for devices like paddles.

> An input box called The UAID (Universal American Disabilities Association Interface Device) connects to the back of the AccuVote-TSX (AVU) and offers voters with accessibility issues the opportunity to vote on an unassisted basis. The UAID relays signals from a sip-and-puff tube or from an ADA switch (button) device to the serial port at the back of the AccuVote-TSX tablet. The UAID only accommodates sighted voters, as the use of the UAID precludes the use of the numeric keypad (since both keypad and UAID require access to the serial port). Each interface operates independently. In other words, plugging in the switch interface will override the sip and puff interface. The Ballot Station software detects whether a numeric keypad or a sip-and-puff device is plugged into the serial port.
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> To use the UAID device, a voter requests a ballot to be voted on using the UAID device. Once the voter submits the voter access card encoded with UAID support into the smart card reader, the ballot is launched, which the voter will then be able to navigate by sipping and puffing using the tube provided.

In addition, a machine recount was tested to ensure it met applicable state law. To run a machine recount, the official starts a new workspace, and identifies the race to be recounted. The system pulls all ballots with that race into the new workspace, along with previously made adjudication decisions. The worker then looks at all undervotes, and if applicable, write-ins, to determine if adjudication decisions need to be made.

Workers make determinations based on state law, administrative rule and the publication 'Voter Intent, Statewide Standards On What Is A Vote'. Any situations not covered are referred to the canvassing board. The recounted race is then tallied for machine recount results.

Adjudication Station Delays

During the Volume/Stress test, 1,500,000 folded ballots were processed to test the outer limits of the system capabilities. Each scanner saves a copy of the scanned image on its machine, and the PCS network controller copies the scanned image to each adjudication PC, where a copy is kept along with any adjudication decisions. The PCS network controller controls access to any ballot id, assigning tokens to a station that is accessing the ballot, and preventing access to any other station. When adjudication decisions are saved, and the ballot is released, all adjudication stations receive the changes.

As the number of ballots grew on the adjudication stations there was a noticeable slowdown in processing the adjudication decisions. The hard disk space was consumed by files other than the ballots. It was discovered that the temporary files created during adjudication processing were not deleted, so the temporary files took over large portions of hard drive space, slowing the system down. Initially, a procedure was produced and tested to delete the temporary files manually when the PC was shutdown each night. This solved the problem. This manual process can only be performed by system administrators. Eventually, it was discovered that the system would delete these temporary files with a new windows setting. The computer was set so that only an Administrator could delete temp files. Therefore, since the adjudication worker is not logged in as an administrator, the temp files were not getting deleted. With the new windows setting, lower security settings allowed temp files to be deleted as part of the processing.

The county was able to process (scan and adjudicate) 215,000 ballots in one 10-hour period.

At the conclusion of the volume/stress test, there were two ballot errors out of 1,500,000 scanned ballots. The two ballots were miss-feeds that were not picked up by the scanner, but were picked up during the adjudication process. The system is designed to identify and report at the time of adjudication any ballot discrepancies caused by miss-feeds during the scanning process that were not picked up by the scanner so that workers will be alerted and process the ballot(s) affected properly.

Humboldt County Missing Ballots

A software error with Premier GEMS central count software was discovered in Humboldt County, CA with the processing of absentee ballots during the 2008 General Election. The error is now known as the Deck 0 Software Error. In Humboldt County's version of Premier's software, a programming error sometimes causes the "deck 0" to be erased if any subsequent deck involving the same type of ballots is erased during central count scanning. Humboldt County had an absentee "deck 0," containing 197 ballots that disappeared from their system in the 2008 General Election.

In October, 2004, when Premier discovered this software error, they sent an email notice and procedures to all the counties with this software version describing how to prevent this problem in future elections. Due to a change in personnel in Humboldt County in 2007, this procedural work-around was lost in the staffing change.

The software error was introduced into GEMS version 1.18.19, and remained through version 1.18.23. It was fixed for 1.18.24. Our office certified version 1.18.24 in 2006, and King County has used that version since. The Deck 0 software error is not present in King County's GEMS software.

Premier now has Product Advisory Notices to alert all customers of software errors uncovered, or system vulnerabilities discovered, with recommended actions. In 2004 the regional support reps contacted their counties for notification of these types of errors, and the work around to use.

Audit Log Deficiencies

While investigating the Deck 0 software error problem, Humboldt County discovered that the tabulation audit logs are deficient. The audit logs have a CLEAR button, allowing batches to be deleted without an entry in the audit log and the date/time stamp data was garbled in some cases.

King County's current GEMS system contains some of these audit logs deficiencies.

The upgraded version of the GEMS software with this Assure 1.2 certification addresses all the deficiencies with the audit logs. The CLEAR button is removed from all audit log functions. (The CLEAR function is part of a suite of controls in the code that is used for other processes, like clearing memory cards for later use. So the function has not been removed from the source code, but it is not called by any audit functions anymore.) Deck deletions are now included in audit log entries. The date/time stamp problem only occurred with the Deck 0 problem, so this is not a problem with the KC current GEMS software, and is not a problem with the upgraded software.

The new modules (PCS and Assure Security Manager) that are part of this certification do not have audit log deficiencies. They do not have a CLEAR button, they record all batch deletions, and they have good date/time stamp data.

Requirements for the content of audit records are described in Section 4 of the 2002 Voting System Standards. Operational requirements for audit trails are described in Section 2.2.5.2 of the 2002 Voting System Standards.

After an evaluation of the system as upgraded, staff believes the system and its components continue to meet current Washington State requirements.

Secretary of State Staff Recommendation

After reviewing the conditions described in the "Current Voting System" section of this report, Secretary of State staff believes that failure to modify the existing system will materially affect the efficiency, accuracy and security of the upcoming elections.

Based on the results of the testing detailed in this report, Secretary of State staff recommends the Premier Election Solutions Assure 1.2 Voting System be certified for use in King County in Washington State under the emergency certification rules per WAC 434-335-212. The approval is contingent on the following conditions, per WAC 434-335-120.

- Additional results audits for the 2009 fall elections are created and approved by the Secretary of State.

- If the system is not certified at the national level by May 21, 2010, then this emergency certification expires and the county must apply for an extension or renewal with the state.